

Studies in the liverwort family Metzgeriaceae (Metzgeriales) from southern Africa. 2. The African species

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Abstract

Of the seven species that occur in southern Africa, *Metzgeria quadrifaria* and *M. saxbyi* are endemic to mainland Africa and *M. madagassa* and *M. nudifrons* are also known from the East African Islands. *Metzgeria madagassa* and *M. quadrifaria* are described, illustrated and distribution maps provided. *Metzgeria nudifrons* is newly reported from Gauteng and *M. saxbyi* from Gauteng and KwaZulu-Natal Provinces of South Africa. Updated distribution maps are provided.

Introduction

A historical review and taxonomic account of the family Metzgeriaceae and the genus *Metzgeria* in the area covered by the 'Flora of southern Africa' (FSA), as well as a key to species, were presented by Phephu and Van Rooy (2013). We recognize seven species of *Metzgeria* in southern Africa of which two (*M. quadrifaria* and *M. saxbyi*) are endemic to mainland Africa, two (*M. madagassa* and *M. nudifrons*) also occur on the East African islands and three (*M. consanguinea* Schiffn., *M. furcata* (L.) Dumort and *M. leptoneura* Spruce) are widespread, mainly pantropical in distribution (So 2004, Wigginton 2009). The aim of this paper is to revise and update the nomenclature, taxonomy and geographical distribution of the species restricted to Africa and the East African Islands.

1. *Metzgeria madagassa* Stephani, *Bulletin de l'Herbier Boissier* 7: 944 (1899), So *New Zealand Journal of Botany* 42: 286 (2004).

Type: Madagascar: Besson *s.n.* (lecto: G!; isolecto: FH). Residual syntypes: Madagascar: Sikora 108 (BM, FH); Mascarenes: Bourbon, Rodriguez *s.n.* (G!), Maurice, Robillard *s.n.* (FH); Tanzania: Flora von Usambara, Maromboi, C. Holst 9055, 10 Aug 1893 (G!, BM, EGR, HBG, FI, M0053659, W6634).

Metzgeria camerunensis Stephani, *Bulletin de l'Herbier Boissier* 7: 945 (1899).

Type: Cameroon: Ekundu pagum, c. 300 metra supra mare in truncis ramisque die 27 m, P. Dusén 106, Oct 1890 (holo: G!).

Metzgeria limbato-setosa Stephani, *Wissenschaftliche Ergebnisse Der Deutschen Xentral-Afrika-Expedition* 2: 111 (1910, 1911).

Type: Rwanda: Rugege-Wald, Kiwu See, Mildbraed 844, 1907 (holo: G!).

Plants yellowish green, turning faint bluish in herbarium, robust. *Thallus* rather large, up to 20–50 mm long, 0.4–1.7 mm wide, flat or weakly to strongly recurved; *branches* irregularly dichotomous, ventral branches frequent; *wing* (8–)10–15(–20) cells wide from midrib to margin; *apex* broadly obtuse, furcate; *margins* recurved or plane, hairy; *costa* 0.08–0.14 mm wide, dorsal cells 2 or 3, ventral cells 2–3(–5), internal medullary cells (10–)16–30, in 4 rows, thick-walled; *laminal cells* 15–60 × 40–80 µm, smooth; *hairs* often paired, lacking on dorsal thallus face, sparse to dense on ventral face of thallus, ventral costa and thallus margins, thallus marginal hairs 0.03–0.1 mm long, geminate, costal hairs 0.1–0.25 mm long. *Gemmae* round or oval to thallus-like, flat, margins hairy, hairs single, arise from thallus margins.

Dioicous. *Male branches* 0.1–0.3 mm wide, globose, glabrous; *female branches* 0.2–0.4 × 3 mm, cordate, obovate, hairs (0.06–)0.1–0.16(–0.3) mm long; *calyptra* 0.2 mm long, hairy; *capsule* and *spores* not seen. (Fig. 1).

Distribution and ecology: The species was previously known from the KwaZulu-Natal, Western Cape and Eastern Cape Provinces of South Africa, but now also reported from Limpopo and Mpumalanga (Fig. 2). *Metzgeria madagassa* shares a distribution pattern with mosses of the Afromontane Forest Element of Van Rooy and Van Wyk (2011) and more specifically the Widespread Afromontane Subelement. Species in this group are widespread throughout the Afromontane (bryofloristic) Region (Van Rooy and Van Wyk 2010).

This species is also known from Malawi, Cameroon, Nigeria, Liberia, Ethiopia, Democratic Republic of Congo, Rwanda, Burundi, Zimbabwe, Mozambique, Tanzania and Uganda as well as the East African islands of Madagascar, Mauritius and Seychelles. In southern Africa *M. madagassa* is found in montane forests and wooded kloofs, on trees and shrubs, at 300–1829 m.

Specimens examined: SOUTH AFRICA: Limpopo: Wolkberg, Wildernis area, Wonderwoud, 2330CC, A. Veltman & M. Potgieter 135, 2 Jul 1993 (PRE). Eastern Cape: Steytlerville, Hankey, 3324DD, 457 m, J. Sim CH1427, Jan 1927 (PRE); Pirie, 3227CC, T.R. Sim CH 1440 (PRE); Hogsback, 3226DB, E.M. Young 1101, Dec 1926 (PRE). KwaZulu-Natal: Edendale, 2930CB, T.R. Sim 1111, Jan 1916 (PRE); Zwaartkop, 2830CB, T.R. Sim 35, 1914 (PRE); Zwaartkop, 2830CB, T.R. Sim CH1434, CH1435 and CH1325, Apr 1915 (PRE); Polela, 2929CB, T.R. Sim CH1432, Jun 1915 (PRE); Koodoo Bush, Mount aux Sources, 2829CC, T.R. Sim CH1410, Jul 1921 (PRE); Donnybrook District, 2929DD, E.J. Scott CH3757, Dec 1945 (PRE); Buccleuch, 2930AD, T.R. Sim CH1407 (PRE). Mpumalanga: Buffelskloof Nature Reserve, along the path to Calodendrum Falls, 2530BC, 1754 m, M. Koekemoer 2245, 17 Feb 2002 (PRE); Rosehaugh, 2530BD, T.R. Sim CH1408, Dec 1914 (PRE). Western Cape: Cape Town, Table Mountain, Skeleton Gorge, 3318CD, J.W. Bews CH1433, Jan 1916 (PRE); Kalk Bay, 3418AB, G. Potts CH1421, Jan 1917 (PRE).

Additional specimens examined: CAMEROON: *Preuss s.n.* (BM); Yumbo, 1080 m, P. Dusén 652, Apr 1892, (G); Mt Cameroon, Ad Bibundi pagum in trincus arborum, P. Dusén 935, 19 Jul 1892 (G); Ad Bibundi pagum in trincus arborum die 3 m, P. Dusén 412, Sept 1891 (G); in montibus Rumpi ad jumbo pagum c. 1100 inter impre nare in ramntis arborum, P. Dusén 929, 17 Apr 1892 (G). DEMOCRATIC REPUBLIC OF CONGO: Hanley Pool, *Leidieu s.n.* (BM). LOANGO COAST: *Micholotz s.n.* (BM).

Notes: Arnell (1963) recognized two species originally described from Cameroon, viz. *M. camerunensis* Stephani and *M. limbato-setosa* Stephani, both which were reduced to synonymy under *M. madagassa* by So (2004). This synonymy is confirmed here. *Metzgeria madagassa* is easily confused with *M. furcata* but is recognized by recurved (though not always) thallus margins and paired bristle-like marginal hairs.

2. *Metzgeria nudifrons* Stephani, *Hedwigia* 31: 126 (1892). So *New Zealand Journal of Botany* 42: 286 (2004); Wigginton, *Tropical Bryology Research Reports* 8: 65 (2009); Phephu and van Rooy, *Polish Botanical Journal* 58(2): 451 (2013).

Type: South Africa: Cape Town, A. Rehmann *s.n.* (lecto: G 00045406!; isolecto: BM!).

Nomenclature and taxonomy: The taxon was treated in detail by Phephu and van Rooy (2013). It is characterized by distinctly broad costa, hairy male branchlets, gemmae on the dorsal surface of the thallus and single, straight hairs on ventral face and margins of the thallus.

Distribution: It was previously known from Limpopo, KwaZulu-Natal, Western Cape and Eastern Cape Provinces of South Africa as well as Lesotho (Fig. 3). The species is here also reported from Gauteng, where it was found in relatively dry woodlands.

Specimens examined: SOUTH AFRICA: Gauteng: Hartebeeshoek Satellite Tracking Station, 2527DC, on rock boulder, ± 1459 m, J. van Rooy 3967 & 3974, 22 Mar 2001 (PRE).

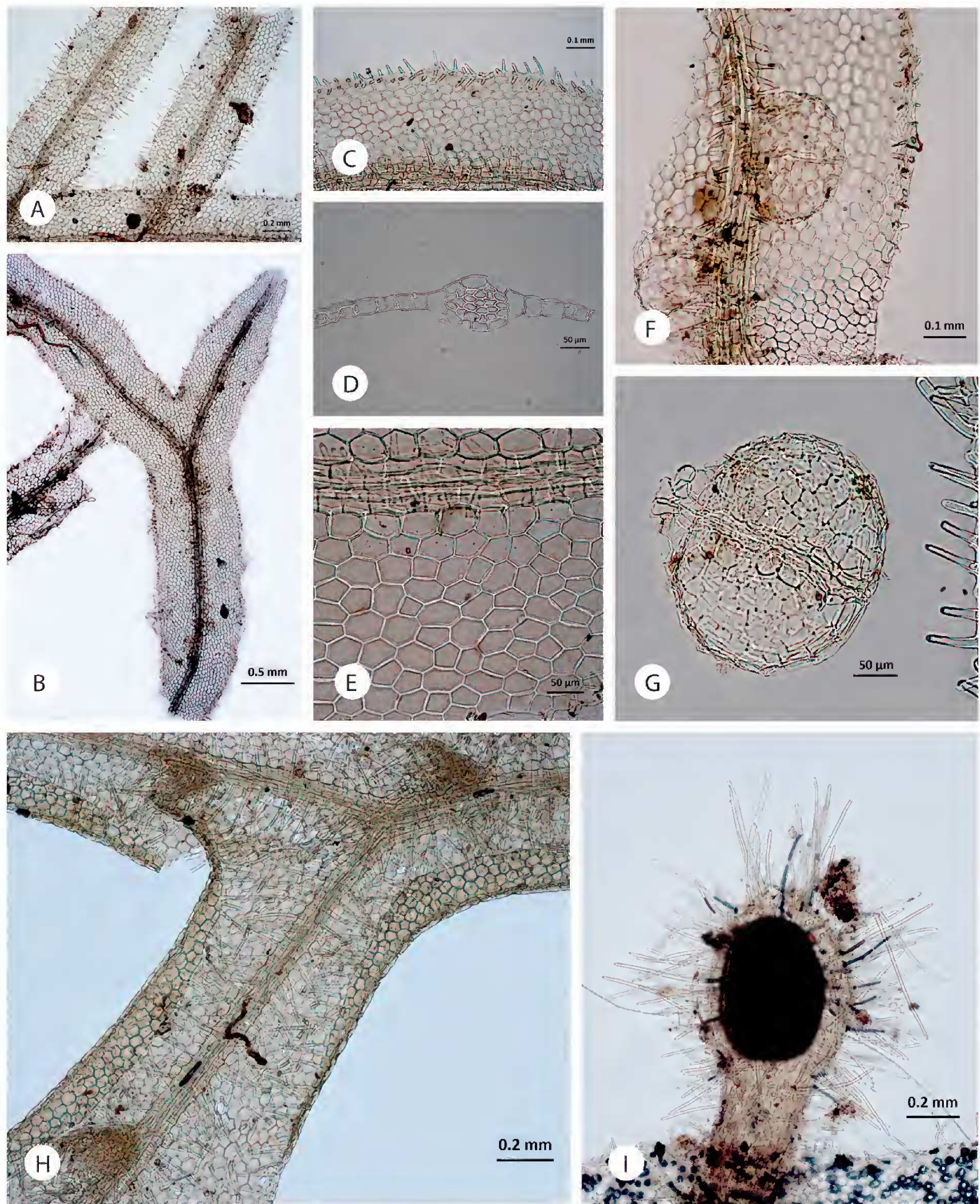


Fig. 1. *Metzgeria madagassa* Stephani: **A, B**, Thallus; **C**, Thallus marginal hairs; **D**, Cross section of costa; **E**, Laminal cells; **F**, Male branch; **G**, Antheridium; **H**, Female branch; **I**, Involucre with calyptra. **A, B, C, D, F, G** from *M. Koekemoer* 2245 (PRE); **E** from *T.R. Sim* CH1407 (PRE); **H** from *Young* 1101 (PRE); **I** from *Sim* CH 1440 (PRE).

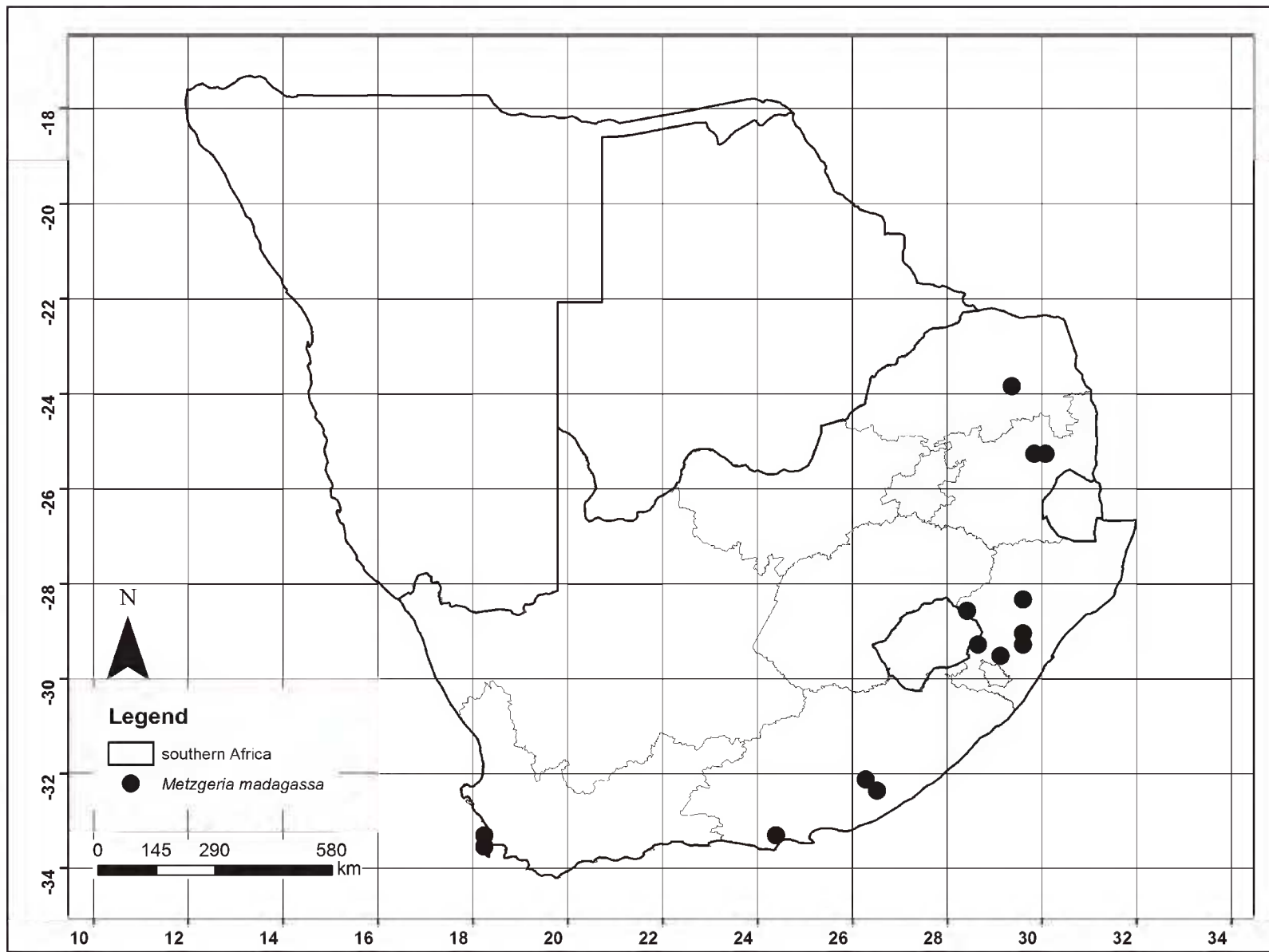


Fig. 2. Distribution map of *Metzgeria madagassa* Stephani in South Africa.

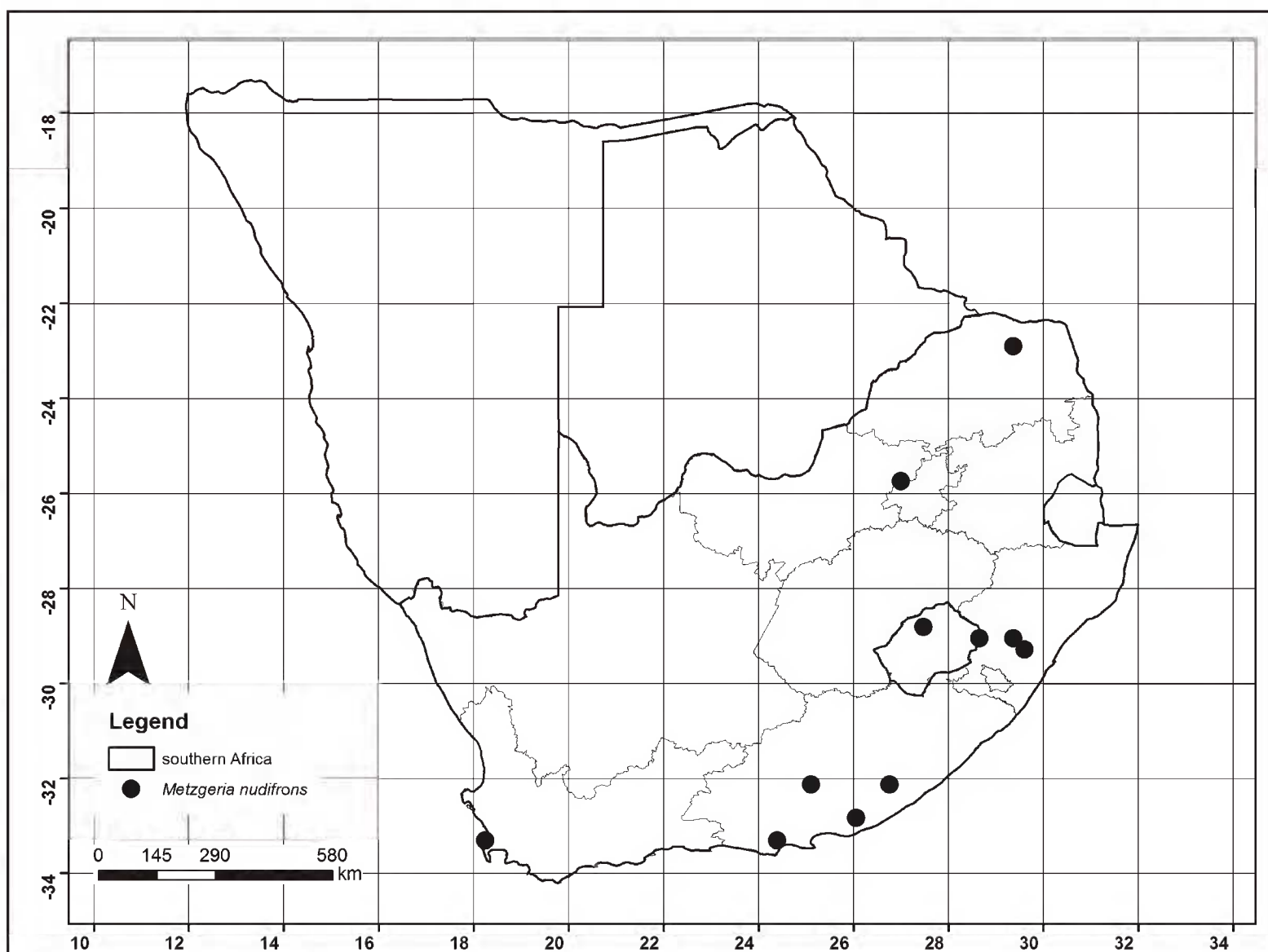


Fig. 3. Distribution map of *Metzgeria nudifrons* Stephani in southern Africa.

3. *Metzgeria quadrifaria* Stephani, *Bulletin de l'Herbier Boissier* 7: 953 (1899); So, *New Zealand Journal of Botany* 42: 286 (2004).

Type: Somalia: Giaribule, G.-D. Riva 82 p.p., 20 Sep 1893 (holo: G!; iso: FH).

Plants yellowish green, often bluish in herbarium specimens, rather large, often strongly attached to substrate. *Thallus* 25–60 mm long, 0.7–2.5 mm wide, strongly convex; branches irregularly branched or dichotomous; *wing* 14–31 cells wide from midrib to margin; *apex* broadly obtuse, furcate; *margins* inrolled or strongly concave, almost tubular, almost nude to hairy; *costa* 0.1–0.2 mm wide, distinctly massive, dorsal cells (3–)5, ventral cells (3–)5–8, medullary cells 24–30 in 3–5 rows; *laminal cells* polygonal or hexagonal, 27–46 × 35–60 µm, smooth, with small to distinct trigones; *hairs* single or geminate, strongly curved or straight, 0.1–0.23 (–0.3) mm long, on thallus margins, ventral face of thallus, ventral costa, lacking on dorsal face of thallus, costal hairs c. 0.2 mm long. *Gemmae* arising from thallus margins, oval or ribbon-like, flat, margins hairy, hairs 0.1 mm long.

Dioicous. Male branches ±0.3 mm wide, globose, nude; female branches not seen. (Fig. 4).

Distribution and ecology: *Metzgeria quadrifaria* is endemic to Africa (So 2004). In southern Africa it is known from the Western Cape and was also reported from Lesotho by Hodgetts et al. (1999) (Fig. 5). Unfortunately, the Lesotho specimen could not be located and it is unclear whether So (2004) actually examined it. The species is also known from Cameroon, Democratic Republic of Congo, Kenya, Madagascar, Tanzania, Uganda, Ruwenzori, Bioko and Somalia where it grows on twigs and tree bark in montane forests, at 1400–3750 m.

In South Africa *M. quadrifaria* occurs in mountain fynbos, up to 671 m above sea level, in the Cape (bryofloristic) Domain, a subdivision of the Afromontane Region of Van Rooy and Van Wyk (2010). The Lesotho locality, at 2950 m, is situated in high altitude grassland and heathland of the Drakensberg Grassland Bioregion (Mucina and Rutherford 2006). Bryofloristically, this area is known as the Drakensberg Alpine Domain, a subdivision of the Highlands Region. It is characterized by a xerophytic moss flora.

Specimens examined: SOUTH AFRICA: Western Cape: Hermanus, 3418AC, J. Burt Davy 18521, Jan 1920 (PRE); Table Mountain, The Saddle, 3318CD, 671 m, T.R. Sim 1512, Jan 1960 (PRE).

Other southern African material: LESOTHO: Leribe, cliff on south side of Hlotse-Ha Lejone Road, east of pass, 2828CC, 2950 m, J. Duckett et al. 3043b, 8 Jan 1995 (herb. Hodgetts).

Additional specimens examined: EQUATORIAL GUINEA: K. Byström 821 (UPS). CAMEROON: Cameroonberg, 2377 m, Y.R. Jungner 151, 1891 (BM, G12842 & G12843); in montibus Camerunensibus, supra Bueaum pugum, c. 2425 m, P. Dusén, 353, 18 Jul 1891, (S B38012 & B38013; G12841). KENYA: Mt Kenya, Teleki Valley, Mt Elgon, in the crater alpine region, O. Hedberg B7369, 16 May 1948 (S).

Notes: This species is recognized by its rather long, wide thallus with obtuse, furcated apices, massive costa and inrolled thallus margins.

Costa (2008), in her monograph of Neotropical Metzgeriaceae, reduced *M. quadrifaria* to synonymy under *M. rufula* Spruce, without indicating that she has studied African material. The occurrence of *M. quadrifaria* in the Neotropics therefore needs confirmation.

4. *Metzgeria saxbyi* Pearson, *Annales de Cryptogamie Exotique* 4: 70 (1931); So, *New Zealand Journal of Botany* 42: 288 (2004). Phephu and van Rooy, *Journal of Bryology* 33: 85 (2011).

Type: Ghana: Tarkwa, Prestca District, Gold coast, H.H. Saxby s.n., 1910 (iso: BR!).

Nomenclature and taxonomy: A concise description of *Metzgeria saxbyi* was provided by Phephu and van Rooy (2011). The species is characterized by its monoicy and single thallus marginal hairs. The typical male branch of African *Metzgeria* species is nude, but we recently observed some hairy male branches in Zimbabwean material of *M. saxbyi*. (Fig. 6).

Distribution: The species was previously known only from the Western Cape and Swaziland, but is now also reported from KwaZulu-Natal and Gauteng (Fig. 7). Although the species has not been collected since 1932, the localities are scattered throughout the Afromontane Region and the habitat in which it occurs is not particularly threatened.

Specimens examined: SOUTH AFRICA: Gauteng: Pretoria, 2528CA, H.A. Wager CH3803, 8 Jun 1928, (PRE); KwaZulu-Natal: Pietermaritzburg, Hilton Road, 2930CB, 1219 m, T.R. Sim, May 1921 1411 (PRE). Western Cape: T. Arts RSA/08/04 (PRE); Cape Town, Table Mountain, Skeleton Gorge, 3318CD, J.W. Bews CH8489, January 1916, (PRE).

Additional specimens examined: ZIMBABWE: South Rhodesia, T.R. Sim 4436, Jul 1920 (PRE).

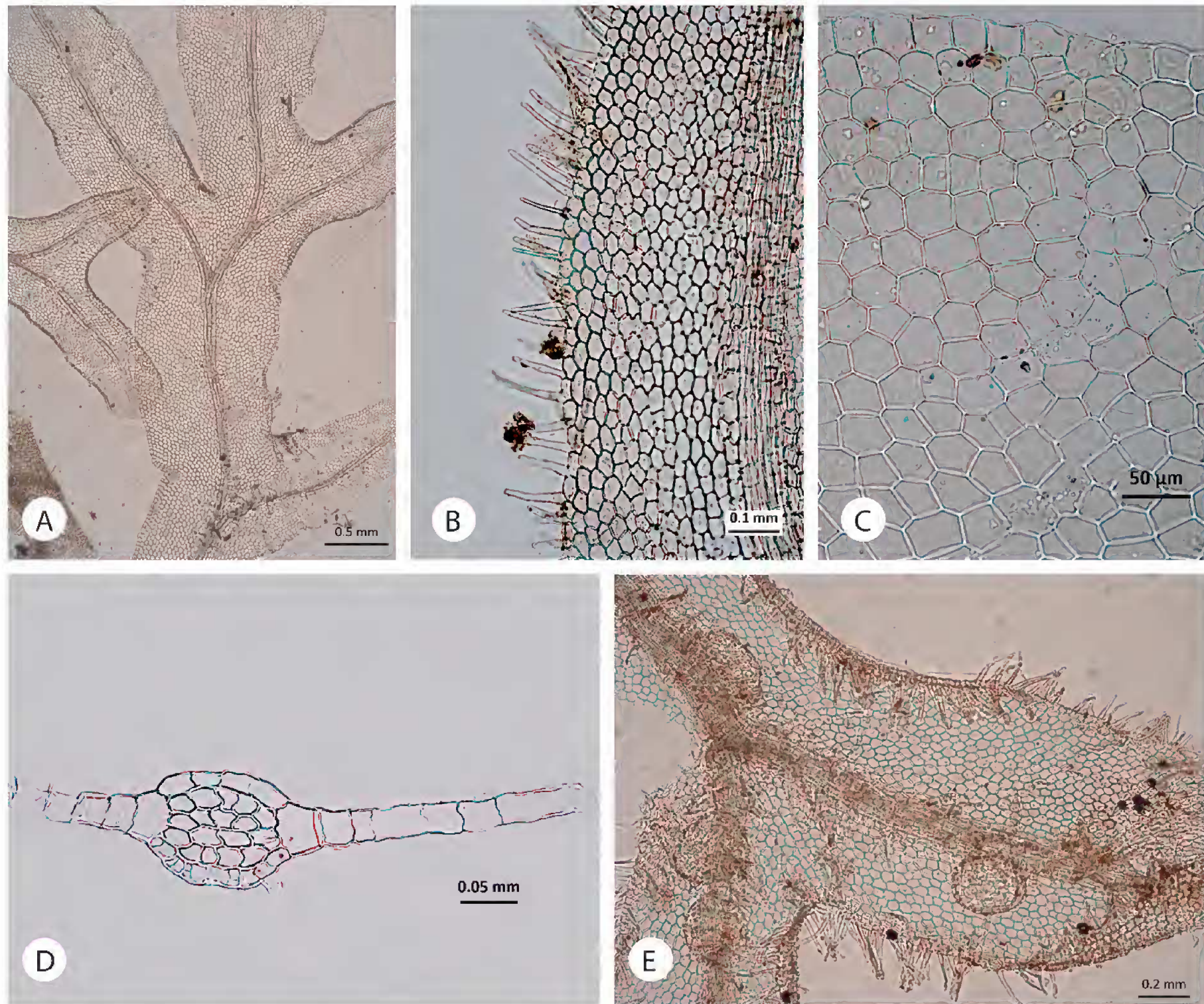


Fig. 4. *Metzgeria quadrifaria* Stephani: **A**, Thallus; **B**, Thallus marginal hairs; **C**, Laminal cells; **D**, Cross section of costa; **E**, Male thallus with antheridia. **A**, **C**, **D** from *T.R. Sim 1512* (PRE); **B**, **E** from *J. Burt Davy 18521* (PRE).

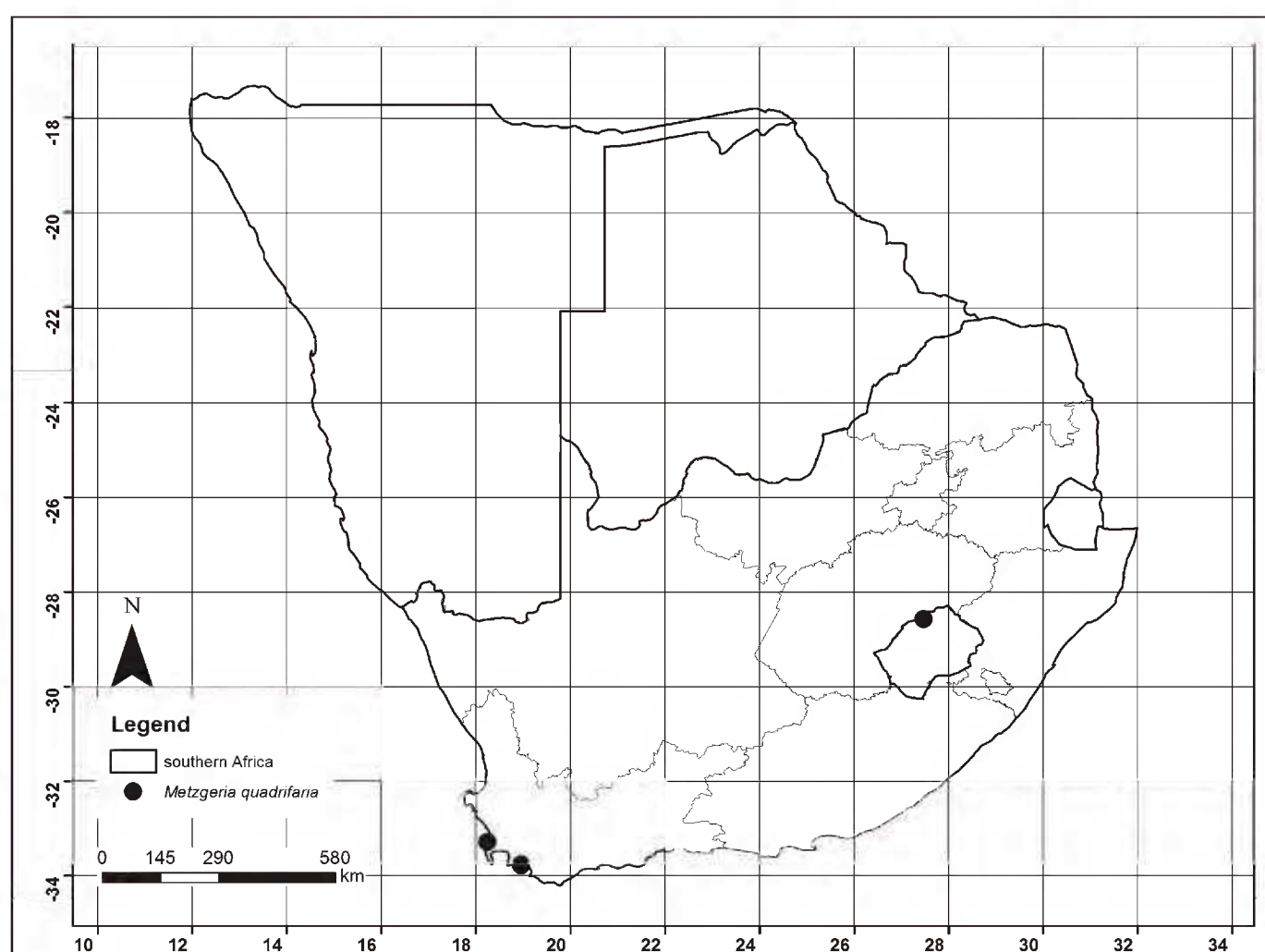


Fig. 5. Distribution map of *Metzgeria quadrifaria* Stephani in southern Africa.

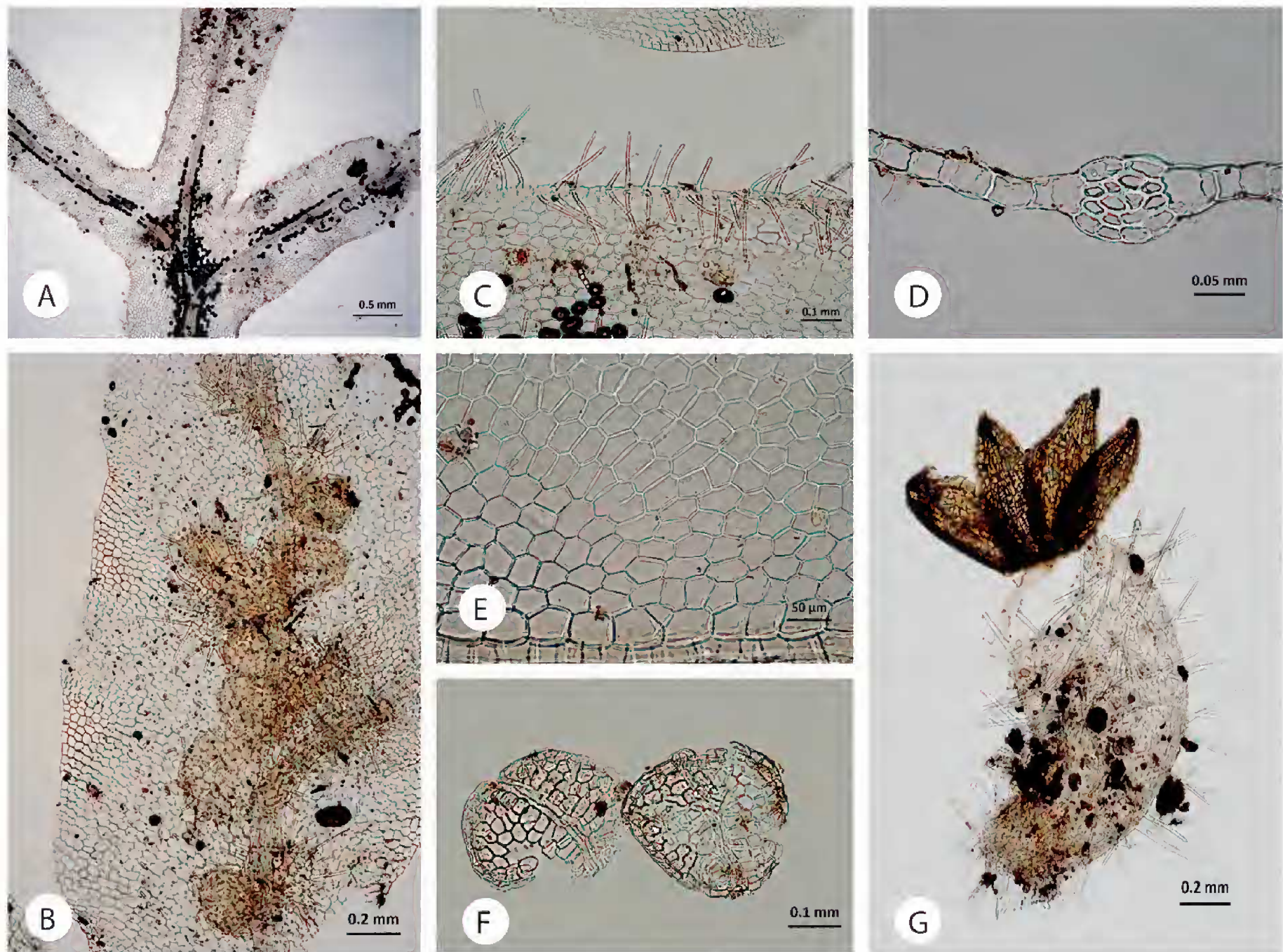


Fig. 6. *Metzgeria saxbyi* Pearson: A, Thallus; B, Ventral surface of thallus with male and female branchlets; C, Marginal hairs. D, Cross section of costa; E, Laminal cells; F, Antheridia; G, Involute with calyptra and capsule valves. A, B, C, F, G from J.W. Bews CH8489 (PRE); D, E from T.R. Sim 1411 (PRE).

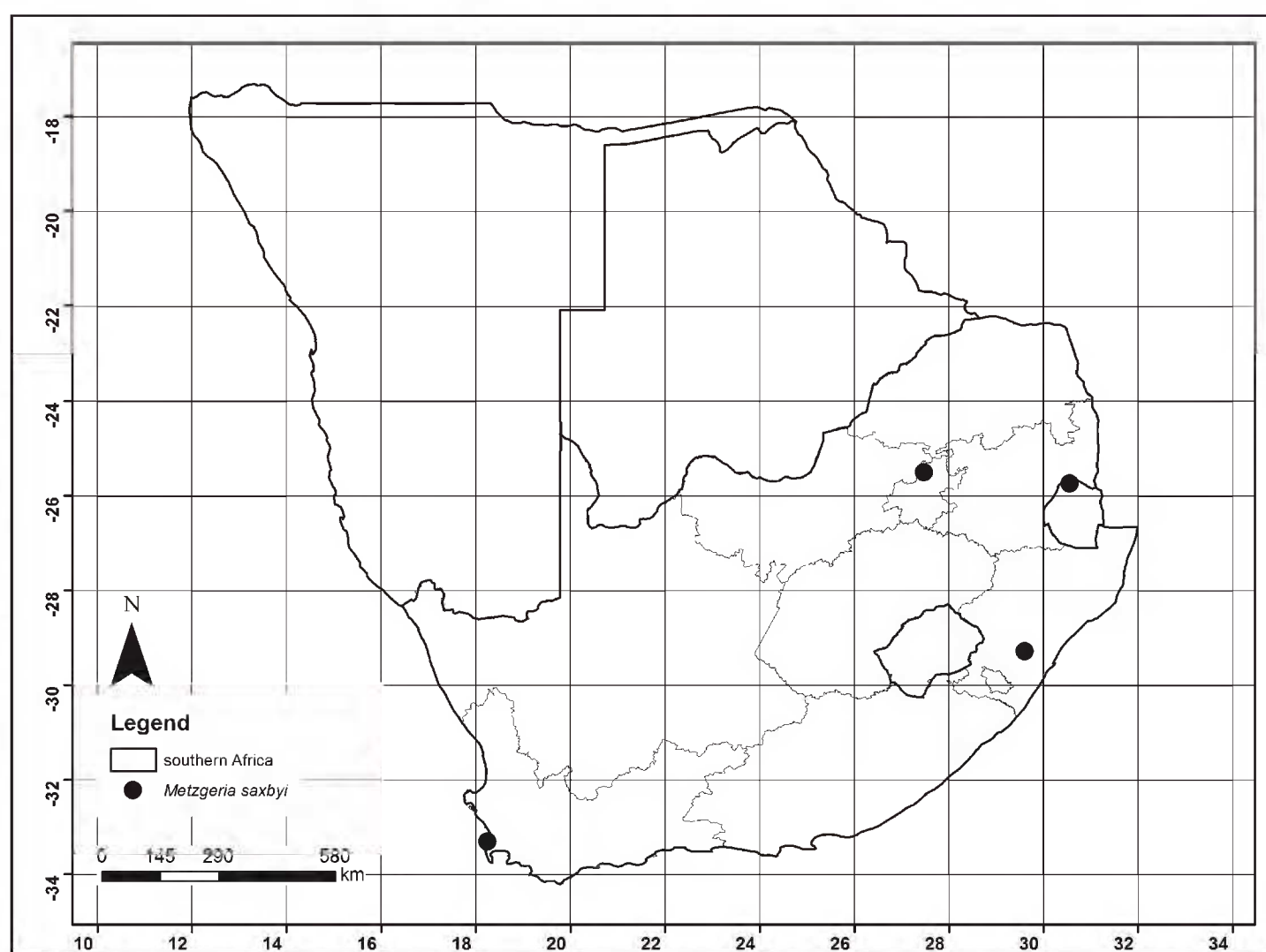


Fig. 7. Distribution map of *Metzgeria saxbyi* Pearson in southern Africa.

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